Space Weather Forecast

Issued on Thursday, 21 December 2023 at 01:16 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of isolated Moderate flares throughout, risk decreasing slightly from Day 3 (23 Dec).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar Activity is Low, with background irradiance at Common-class levels, occasional flares and a peak Common-class flare at 20/0854 UTC from a region in the northeast. Eleven sunspot regions currently feature on the visible disc. The largest spot is a region in the southeast, which is one of the more magnetically complex and is currently the most active region on the disc. The second largest region is in the northwest, it spread horizontally through 20 Dec, and shown some growth and decay of intermediate spots. The most significant region in the western hemisphere lies in the southwest and has displayed minor evolution with ongoing penumbral growth observed around a north-south aligned central portion. The remaining regions are all comparatively smaller or magnetically simple.

No Earth-directed coronal mass ejections (CMEs) have been observed in coronagraph imagery. However, a flare from a region in the southeast around 20/2130 UTC appears to have produced a CME which will be analysed if and when imagery becomes available.

Solar Wind / Geomagnetic Activity: The solar wind environment was characterised the waning effects of a stream of fast solar winds from a coronal hole and the glancing blow of a weak coronal mass ejection from 15 Dec around 20/0000 UTC. Solar wind as measured by ACE at L1 were initially strong, around 600 km/s, but began declining around 20/0400 UTC and since 20/1200 UTC have remained at slightly elevated levels, around 420-450 km/s. Speeds measured by DSCOVR are slightly higher, and are currently stable and around 480km/s. The important north-south component of the IMF has been predominantly negative and has varied weakly. Resultant geomagnetic activity was largely Quiet to Unsettled (Kp 1-3), but with an Active (Kp4) interval from 20/0000-0300 UTC. Density was initially below average, increasing to average around 20/0800 UTC where it has predominantly remained.

Energetic Particles / Solar Radiation: High Energy Proton flux has been at Background levels with no solar radiation storms observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Low with a chance of becoming Moderate with isolated Moderate flares.

Solar Wind / Geomagnetic Activity: No Earth directed coronal mass ejections currently feature in the forecast.

Wind speeds are expected to be initially at slightly elevated or slow ambient levels Day 1 (21 Dec). The next potential enhancement from a fast stream of solar winds may arrive late Day 1 or more probably Day 2 (22 Dec). Speeds could peak between slightly elevated and strong levels. Winds should trend back towards background levels from Day 3 (23 Dec).

Geomagnetic activity should remain largely Quiet to Unsettled (Kp 0-3) during the period. There is a chance of peak Active (Kp 4) conditions and a slight chance of a G1/Minor Geomagnetic Storm (Kp 5) should connection to fast winds take place late Day 1 or Day 2 (21-22 Dec). This

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may produce some enhancement to the auroral oval late Day 1 or Day 2.

Energetic Particles / Solar Radiation: Solar radiation storms are considered very unlikely.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	10	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	50	50	40	40
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	5	5	5	10
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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